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January 16, 2004

Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, D.C. 20554

RE: WT Docket No. 03-103
Notice of *Ex Parte* Presentation

Dear Ms. Dortch:

This is to inform you that AirCell, Inc. ("AirCell") made an *ex parte* presentation on January 14, 2004 with respect to the above-referenced proceeding. AirCell representatives Jack Blumenstein, Jim Stinehelfer, Joe Cruz, Bill Gordon, and I met with the following Wireless Telecommunications Bureau ("WTB") staff: David Furth, Shellie Blakeney, Kathy Harris, Richard Arsenault, Jay Jackson, Tom Derenge and Moslem Sawez, and the following representatives from the Office of Engineering and Technology ("OET"): Julie Knapp, Neal McNeil, Shameeka Hunt and Salomon Satche.

The presentation discussed the points set forth in AirCell's comments and reply comments in the Air-Ground proceeding, including background on the AirCell system and the current airborne communications service providers, and AirCell's interest in exploring future use of the 800 MHz air-ground band for its operations. In addition, AirCell presented material contained in the attached slides to demonstrate how a restructuring of the ATG band would permit the two existing air-ground service providers to transition to digital service, permitting them to provide feature-rich, broadband, spectrally efficient service to the flying public.

Pursuant to Section 1.1206(b)(1) of the Commission's rules, I am filing this notice electronically in the above-referenced docket. In addition, I am sending one copy of this notice to each of the FCC staff listed below. Please contact me directly with any additional questions.

Respectfully submitted,

Michele C. Farquhar
Counsel to AirCell, Inc.

Enclosures

cc: David Furth
Shellie Blakeney
Kathy Harris
Richard Arsenault
Jay Jackson
Tom Derenge
Moslem Sawez
Julie Knapp
Neal McNeil
Shameeka Hunt
Salomon Satche

FCC Presentation

Prepared by
AirCell Inc.

January 14, 2004

AirCell's Business Today

- **AirCell is the leading provider of voice and data air-ground communication solutions to General Aviation.**
- **AirCell is offered by 12 aircraft manufacturers as standard or optional equipment on new aircraft.**
- **AirCell products and services are offered by over 300 FAA-Certified dealers.**
- **AirCell system is currently installed and testing with Frontier Airlines.**
- **AirCell has a 134 site network providing service to over 1500 aircraft**

AirCell Near Term-Soon!

- AirCell has petitioned the FCC for:
  - An extended waiver period
  - An increase in network capacity to 19 channels
  - An elimination of the digital exclusion

AirCell Long Term -12 Months

- AirCell wishes to relocate to the ATG band and evolve to digital cellular based service:
  - 16x Capacity
  - “Clean” spectrum
  - Feature rich offering possible
  - Feature transparency (same service ground and air)
  - Natural evolution to use of mobile phones in the air
- AirCell has an experimental license for testing digital formats.

ATG Proceeding

- AirCell and AirFone are the only two terrestrial-based air-ground telephone providers in operation today.
- AirFone and AirCell have both recognized the need to transition to a digital cellular based system.
- AirFone's proposal for exclusive use of the Band would result in a monopoly market.

Two Providers Can Share the ATG Band

- Expert team lead by Joe Cruz has been working on this program for four months.
- Modeling demonstrates that AirCell and AirFone can share the band and still offer greatly expanded, feature-rich broadband services.
- Evolutionary steps to use of personal cell phones in flight (RTCA subcommittee).

Evaluation of ATG(NATS) Spectrum Restructuring Proposal

Presentation to FCC

Prepared by
AirCell

Presented by
Joe Cruz

January 2004

Presentation Outline

- Introduction
- Proposal description
- Proof of proposal
- Transition plan for incumbent ATG operator
- Summary and conclusions

Introduction

- Purpose
  - Evaluate possibility of ATG spectrum restructuring
  - Examine
    - Likelihood of harmful interference
    - Impact of the interference on spectral capacity
    - Methods for interference mitigation
- Method
  - Analysis by simulation – Monte Carlo approach
  - Developed sophisticated Matlab-based system simulation tool
  - Simulation results compared/checked with theoretical bounds

ATG Spectrum Restructuring

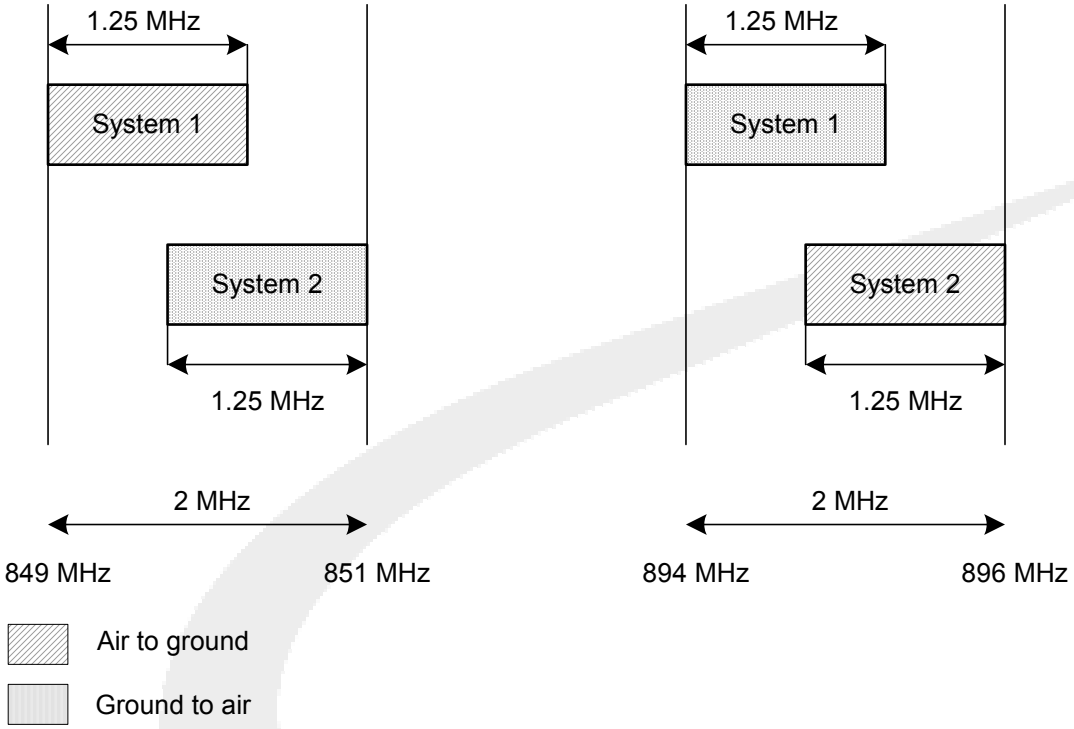


Illustration of the ATG spectrum restructuring proposal

- Re-farm existing frequency bands:
  - 849-851 MHz
  - 894-896 MHz
- Supports frequency duplex operation of a 3G digital technology
- Two 1X - CDMA systems
- Channel BW ~ 1.25MHz
- Spectrum overlap 500KHz
- To reduce inter-system interference – spectrum allocation is swapped – meaning the only cross-interference probability is between aircrafts of respective systems

Interference Potential

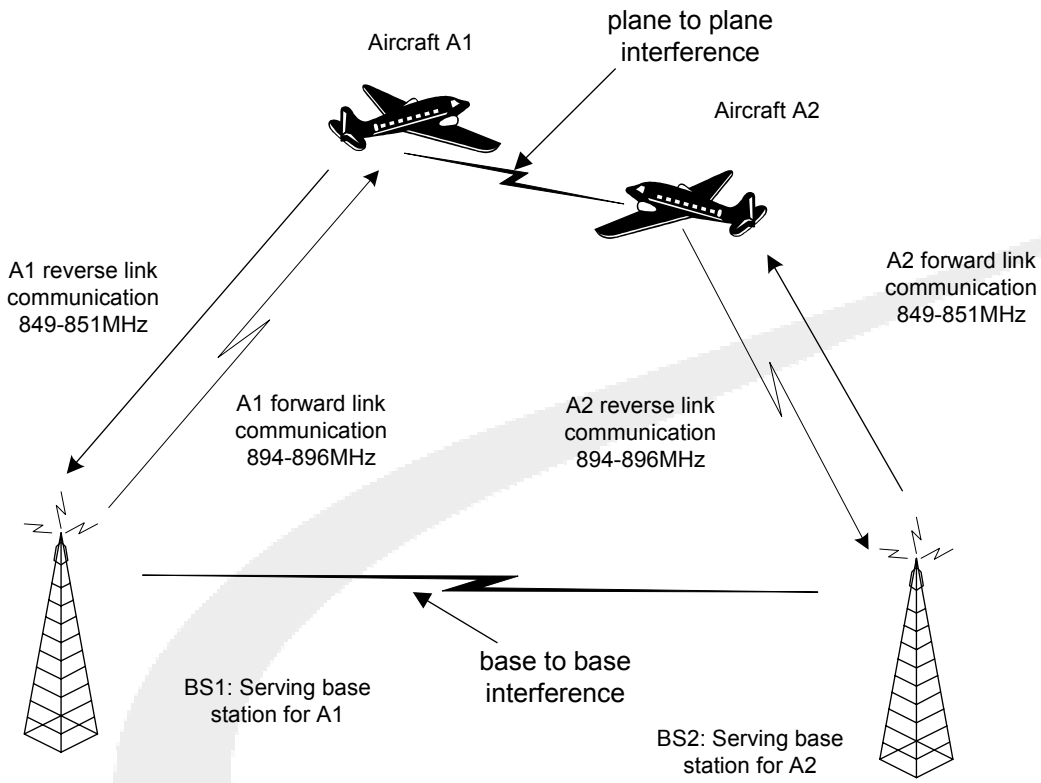
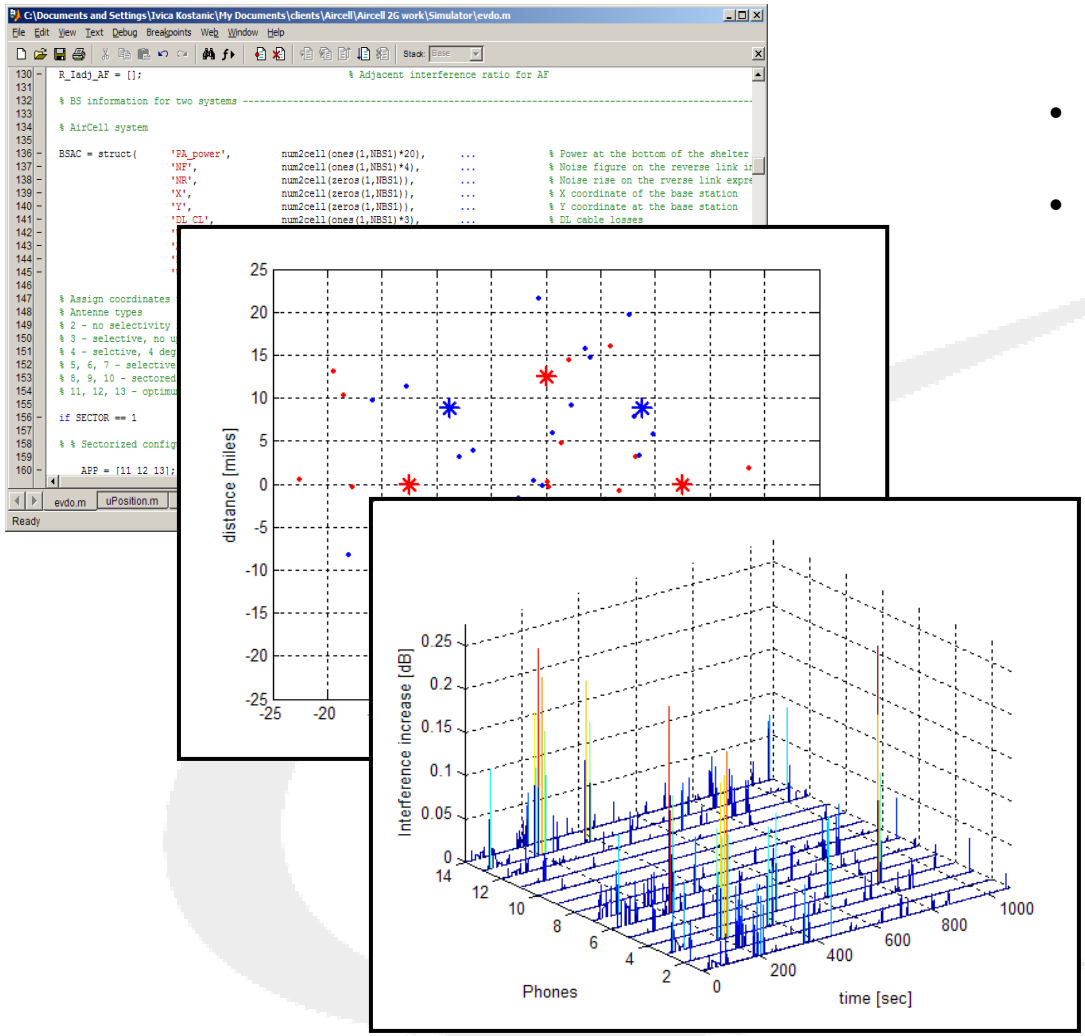


Illustration of the reasons for cross-system interference

- Reason for interference potential– 500KHz of spectrum overlap
- Potential interference paths
  - Reverse link of one system to forward link of the other (aircraft to aircraft)
  - Forward link of one system to reverse link of the other (base to base)
- Base to base interference – easily controlled by base physical separation
- Need to model/evaluate aircraft to aircraft interference potential

ATG Restructuring Simulator



- Simulator developed on Matlab platform
- Performs five steps

1. Initial distribution of aircraft and velocity assignments (tens to hundreds of aircraft at unique altitudes-velocities simulated over multiple hours of flight time)
2. Propagation path loss calculations (aircraft-to-aircraft, base-to-aircraft)
3. Evaluation of systems' performance without interference (single network)
4. Evaluation of systems' performance with interference (two networks with overlapped spectrum)
5. Update aircraft positions and repeat steps 1 through 4

SINR - Key Performance Indicator

Forward link Signal to Noise and Interference (SINR)

$$SINR = \frac{S}{I_1 + I_2 + \cdots + I_N + I_{CS} + N_0}$$

I_{CS} Cross system interference term

Data rate [kb/sec]	SINR [dB]
38.4	-12.5
76.8	-9.5
102.6	-8.5
153.6	-6.5
204.8	-5.7
307.2	-4.0
614.4	-1.0
921.6	1.3
1228.8	3.0
1843.2	7.2
2457.6	9.5

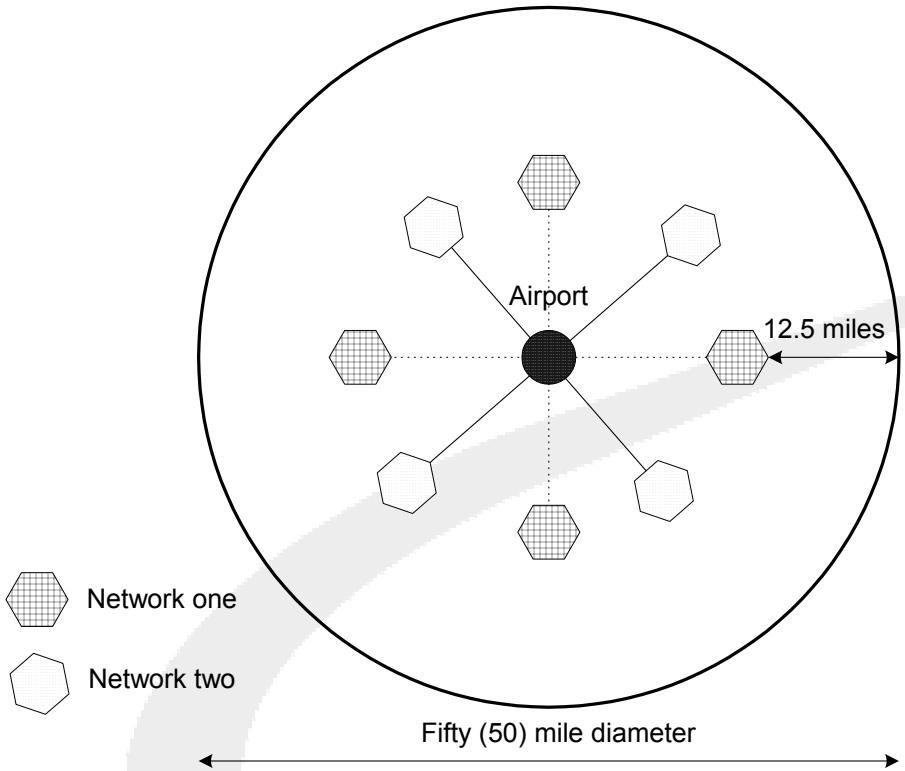
- SINR used in forward link data rate management
- Cross system interference degrades SINR
- Degradation of SINR reduces forward link data rate BUT does not cause either system to degrade in a “harmful” manner
- Difference between SINR without and with *Ics* used as KPI

Mapping between SINR and FWD link data rate

ATG Spectrum Restructuring
Public Benefit

- Brings state-of the-art wireless telecom technology to commercial and GA aircraft
- Dramatic spectral efficiency enhancement:
  - Airport Scenario (on a per airport region basis)
    - Existing ATG 6KHz Plan– up to 29 voice channels
    - Reallocated ATG Plan- at 50% pole point loading, 240 voice channels per network or 480 voice channels total (both networks)
  - A factor of 16X spectral efficiency improvement

Airport Scenario
Dual System Topology



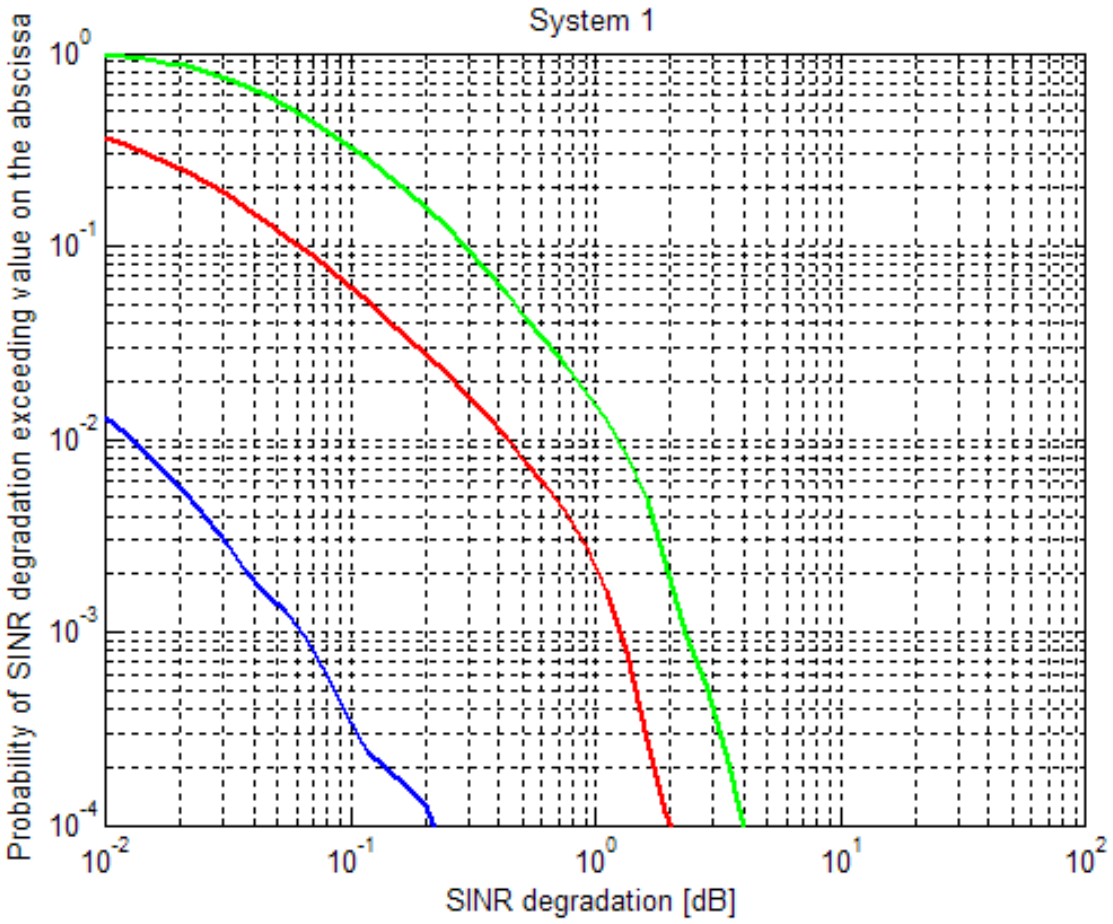
Topology of the inter-system test bed for airport scenario

- Simulation parameters
  - Three sectored sites
  - 120 degrees pattern with null fills (no nulls more than 20dB below the peak)
  - Altitudes 1000 – 30000 feet
  - 10 voice calls per plane
  - Three different loading scenarios

Mapping between system loading and the number of supported aircraft

Loading [%]	Number of aircraft
25	12
50	24
75	36

Airport Scenario
Probability of SINR Degradation

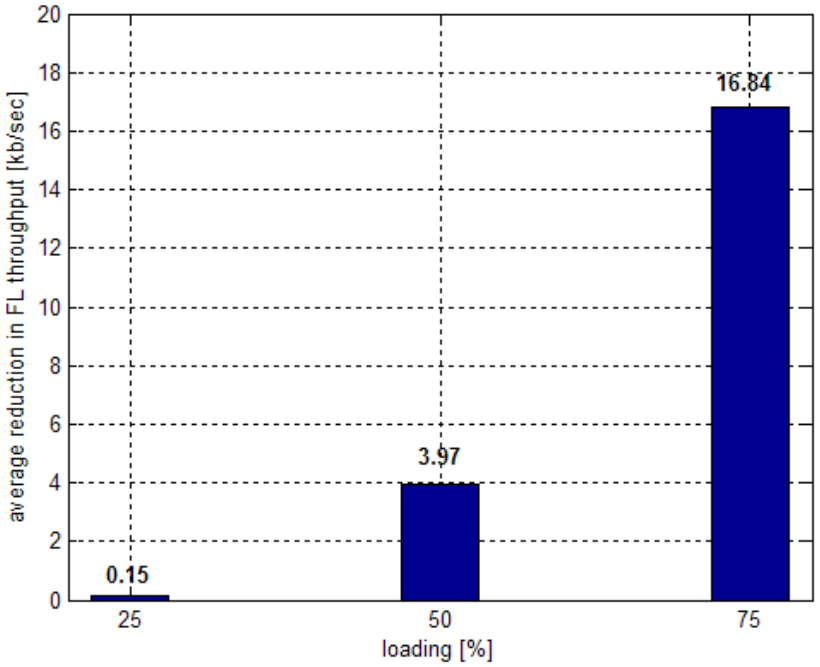


Blue: 25% loading
Red: 50% loading
Green: 75% loading

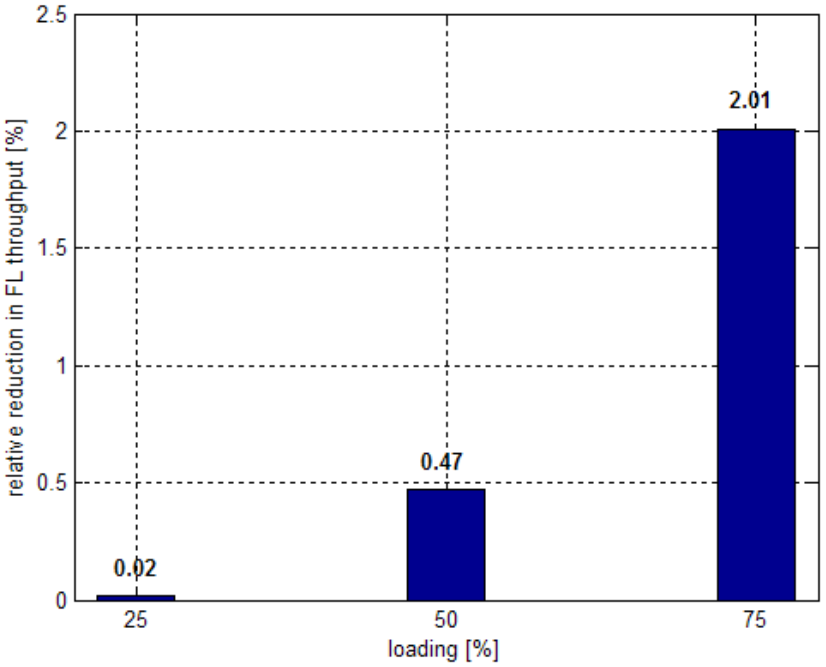
When loading is less than 50%, the probability of interference is extremely small

Airport Scenario

Throughput Reduction from Dual Network Operation



- Absolute throughput reduction – smaller than 17Kbps in worst case
- Typical throughput reduction – less than 4Kbps



- Relative throughput reduction – smaller than 2% in worst case
- Relative throughput reduction – smaller than 0.5% in typical case

Airport Scenario
Dual Network Operation Summary

Probability of experiencing SINR degradation larger than 1dB

Loading [%]	System 1 [%]	System 2 [%]	Average [%]
25	0	0	0
50	0.2	0.2	0.2
75	1.5	1.6	1.55

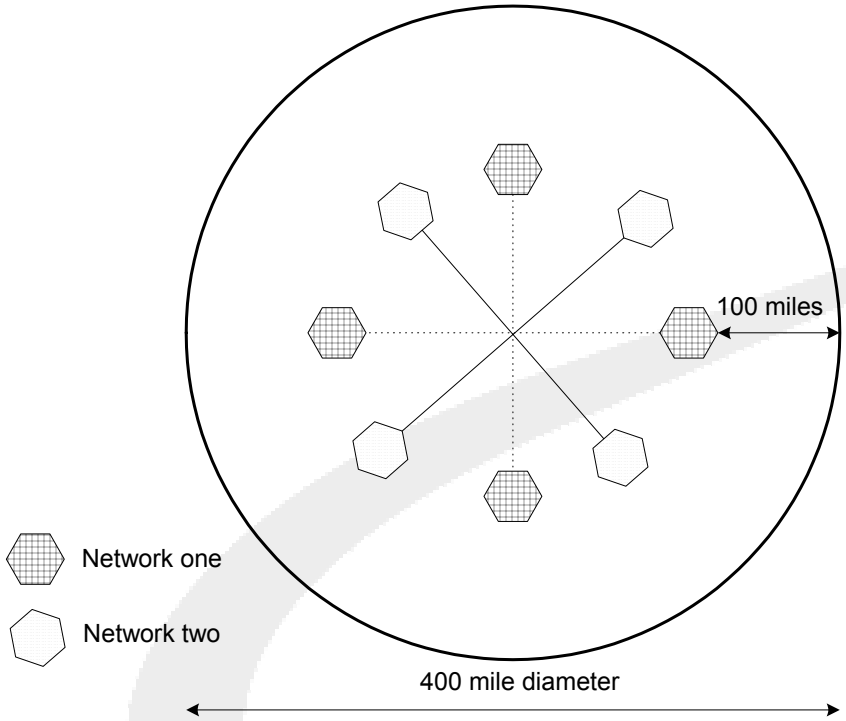
(compared to a single CDMA network located in the NATS band)

Absolute and relative forward link throughput reduction

Loading [%]	Absolute reduction [kb/sec]	Relative reduction [%]
25	0.15	0.02
50	3.97	0.47
75	16.84	2.01

(compared to a single CDMA network located in the NATS band)

Cross Country
Dual System Topology



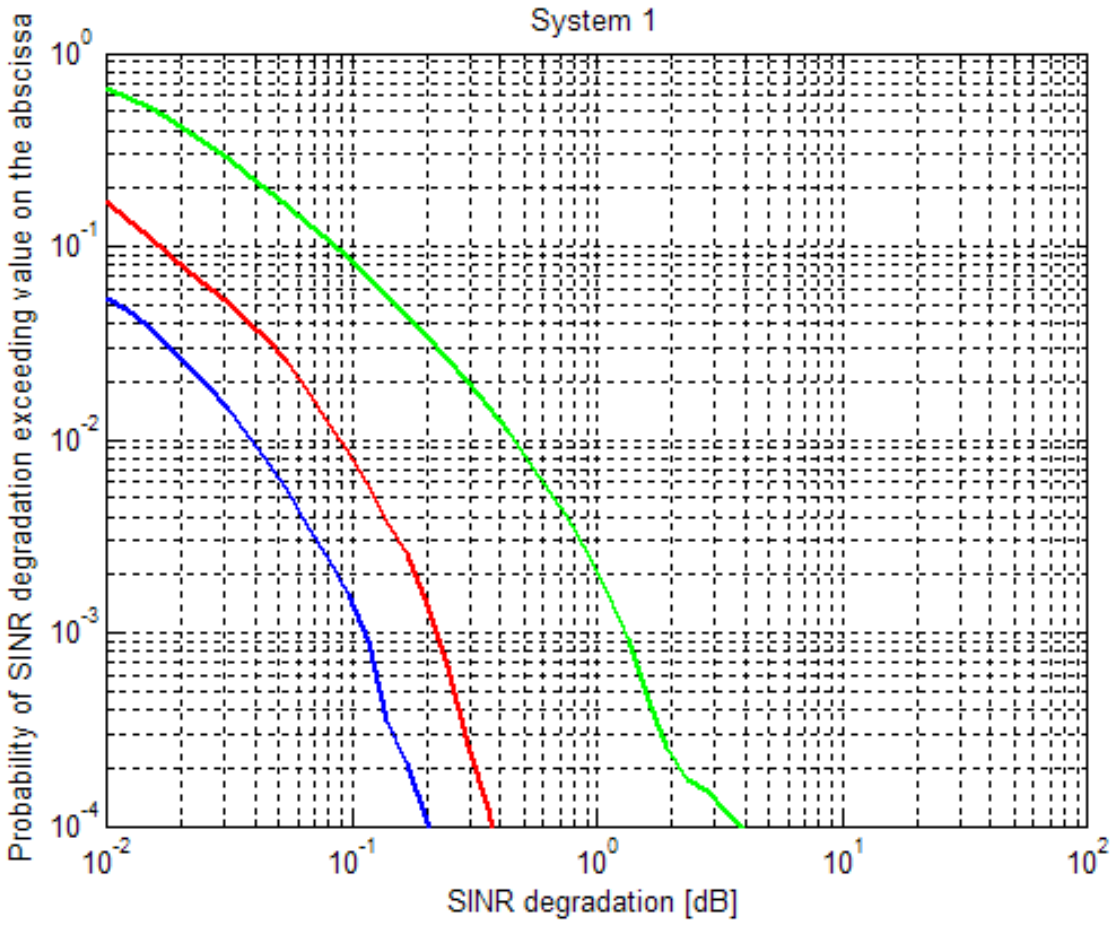
Topology of the inter-system test bed for cross-country scenario

- Simulation parameters
  - Omni-directional sites
  - Antenna patterns with null fills (no nulls more than 20dB below the peak)
  - Altitudes 18000 – 30000 feet
  - 10 voice calls per plane
  - Three different loading scenarios

Mapping between system loading and the number of supported aircraft

Loading [%]	Number of aircraft
25	4
50	8
75	12

Cross Country
Probability of SINR Degradation

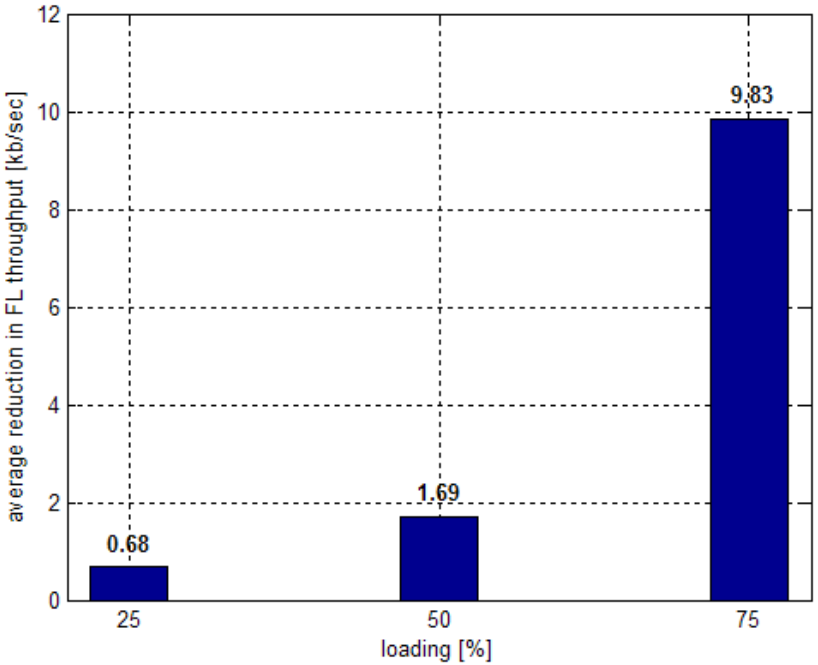


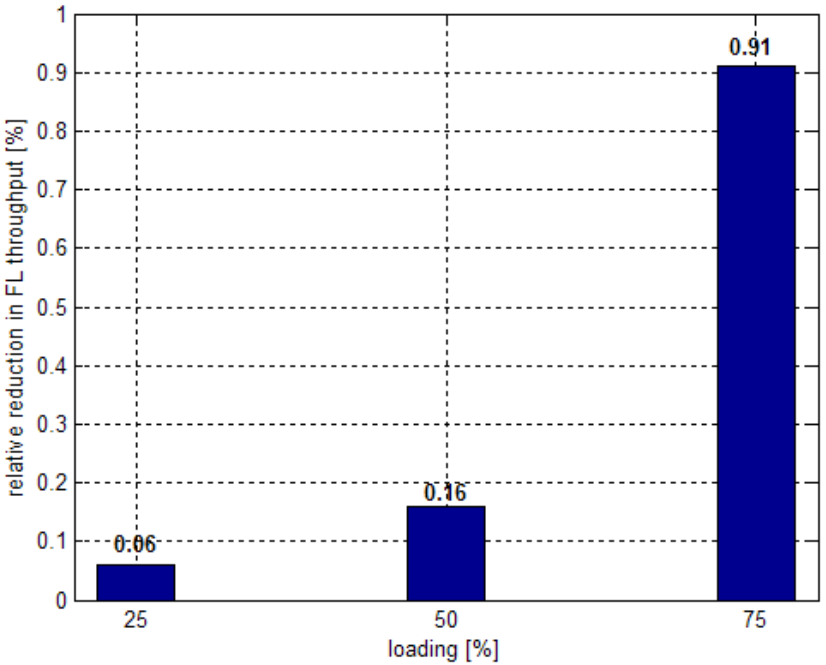
Blue: 25% loading
Red: 50% loading
Green: 75% loading

When loading is less than 50%, the probability of interference is extremely small

Cross Country

Throughput Reduction from Dual Network Operation





- Absolute throughput reduction – smaller than 10kbps in worst case
- Typical throughput reduction – less than 2kbps

- Relative throughput reduction – smaller than 1% in worst case
- Relative throughput reduction – smaller than 0.2% in typical case

Cross Country
Dual Network Operation Summary

Probability of experiencing SINR degradation larger than 1dB

Loading [%]	System 1 [%]	System 2 [%]	Average [%]
25	0	0	0
50	0	0	0
75	0.2	0.15	0.175

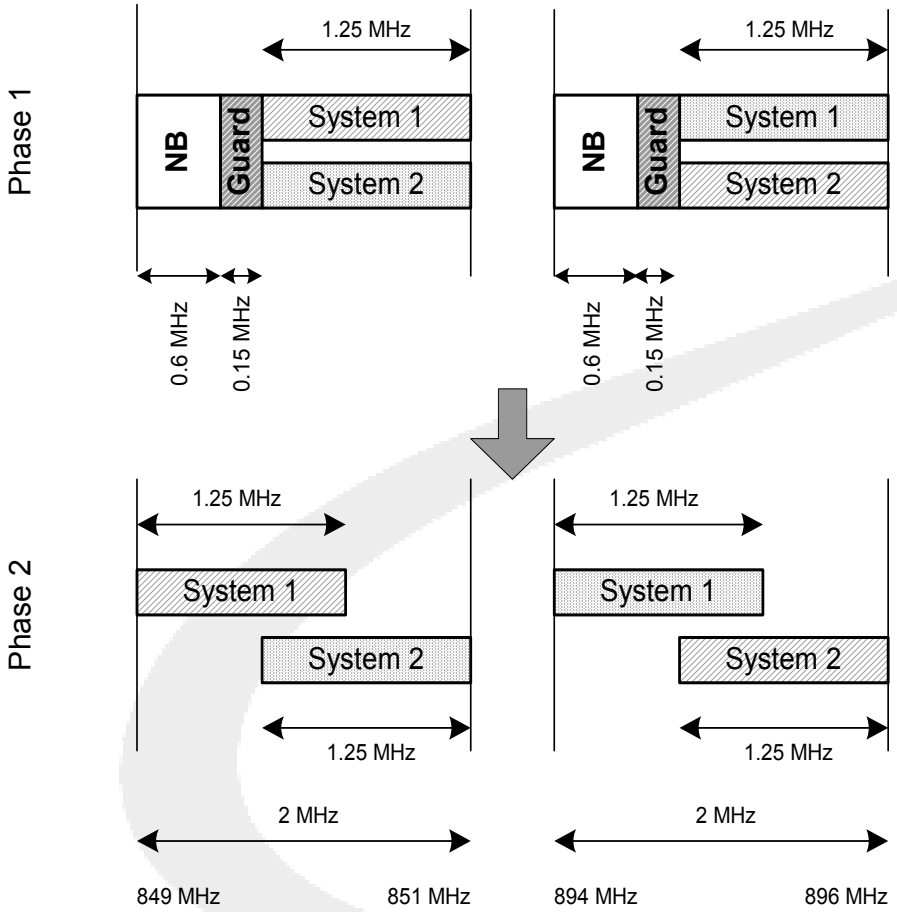
(compared to a single CDMA network located in the ATG band)

Absolute and relative forward link throughput reduction

Loading [%]	Absolute reduction [kb/sec]	Relative reduction [%]
25	0.68	0.06
50	1.69	0.16
75	9.83	0.91

(compared to a single CDMA network located in the ATG band)

Migration Spectral Map



- Phase 1
  - CDMA overlap 100%
  - Lower CDMA system loading of 25% during this phase
  - K=3 spectral plan for 6KHz NATS operation during transition (three channel blocks at bottom of band)
- Phase 2
  - 2 wideband systems
  - overlap 40% (.5/1.25)
  - no legacy systems
  - high system loading

Air to ground
Ground to air
Existing narrowband system
Guard band

Airport Scenario - migration
Dual Network Operation Summary

100% Spectral overlap

Probability of experiencing SINR degradation larger than 1dB

Loading [%]	System 1 [%]	System 2 [%]	Average [%]
25	0	0	0
50	1	1	1
75	6	6.2	6.1

(compared to a single CDMA network located in the ATG band)

Absolute and relative forward link throughput reduction

Loading [%]	Absolute reduction [kb/sec]	Relative reduction [%]
25	0.28	0.03
50	8.94	1.07
75	42.84	5.12

(compared to a single CDMA network located in the ATG band)

Cross country - migration
Dual Network Operation Summary

100% Spectral overlap

Probability of experiencing SINR degradation larger than 1dB

Loading [%]	System 1 [%]	System 2 [%]	Average [%]
25	0	0	0
50	0.01	0.01	0.01
75	0.9	0.5	0.7

(compared to a single CDMA network located in the ATG band)

Absolute and relative forward link throughput reduction

Loading [%]	Absolute reduction [kb/sec]	Relative reduction [%]
25	1.57	0.14
50	6.33	0.58
75	20.03	1.83

(compared to a single CDMA network located in the ATG band)

Proposed Transitional Timeframe

- Licensed ATG incumbent operator MUST undergo a technology transition independent of whether a single or dual CDMA network approach is adopted
- The dual network transitional approach causes no measurable harm to incumbent, thus dual CDMA network approach maximizes the public benefit
- Proposed transitional timeframe to dual, overlapped CDMA network restructuring is 9-18 months with mandatory incumbent transition at the end of the transitional period

Summary and Conclusions

- Restructuring of the ATG (NATS) spectrum is a technically viable proposal
- Spectrum restructuring causes minimal, manageable cross system interference
- For 1xEvDO deployment – interference mitigated through:
  - Control of system loading
  - Base antenna pattern design
  - Use of polarization isolation (not a required systems spec)
- Interference mitigation reduces cross system interference to negligible levels
- Spectral efficiency is enhanced by 16X at airport locations
- **For maximum public benefit/competition, FCC should mandate a shared solution so that both existing air-ground providers (AirCell and AirFone) can offer expanded digital services to consumers.**

Thank You